

Customer No.: 31561
Application No.: 10/708,372
Docket No.: 12680-US-PA

REMARKS

Present Status of the Application

Claims 12-31 remain pending of which claims 12 and 20 have been amended and claims 27-31 have been newly added to more explicitly describe the claimed invention. The amendments to claims 12 and 20, and the subject matter of new claim 27 are fully supported at paragraphs [0021], and [0032] and [0034], and FIGs. 4, 6-12, respectively. Therefore, it is believed that no new matter adds by way of amendment to claims 12 and 20, and addition of new claims 27-31, or otherwise to the application.

In the outstanding Office Action, Claims 12-14, 16-22 and 24-26 were rejected under 35 U.S.C. 102(b) as being anticipated by Thei et al. (US-6,335,249, hereinafter Thei); and Claims 12-26 were rejected under 35 U.S.C. 102(b) as being anticipated by Lin. et al. (US-6,211,022, hereinafter Lin).

For at least the following reasons, Applicant respectfully submits that claims 12-31 are in proper condition for allowance. Reconsideration is respectfully requested.

Discussion of the claim rejection under 35 USC 102

1. *The Office Action rejected Claims 12-14, 16-22 and 24-26 under 35 U.S.C. 102(b) as being anticipated by Thei et al. (US-6,335,249, hereinafter Thei).*

Applicants respectfully disagree and would like to point out that rejection under 35 U.S.C. 102 requires that each and every elements of the claim(s) must be disclosed exactly by a single prior art reference.

Applicants respectfully submit that Thei cannot anticipate the amended proposed independent Claims 12 and 20 because Thei substantially fails to teach or disclose each

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and every features of the claimed invention as claimed in the amended proposed independent Claims 12 and 20. More specifically, Thei substantially fails to teach or disclose a shallow trench isolation comprising at least [a HDP insulating layer, disposed in the trench] as required by the amended proposed independent claims 12 and 20.

Instead, in FIG. 2, col. 5, lines 4-20 (more specifically col. 5, line 17), Thei substantially teaches or discloses a CVD insulating layer is deposited in the shallow trenches. Thus, it is clearly evident that Thei substantially fails to teach or disclose a HDP insulating layer in the shallow trench, instead Thei teaches or discloses a CVD insulating layer in the shallow trench. Accordingly, Thei cannot possibly anticipate the proposed amended claims 12 and 20 in this regard.

Thus, for at least the foregoing reason, Applicants respectfully submit that the proposed independent claims 12 and 20 patently define over Thei in this regard.

Furthermore, Applicant respectfully submits that as argued in response to the prior first office actions, the conformal etch-stop layer (24) of Thei, which the Examiner deems equivalent to the liner layer of the present invention, is in fact formed on the STI (12) AFTER the TWO RTAs processes are performed to form the metal salicide (22) (FIGS. 1-3, col. 5, line 1 to col. 6, line 1), indicating that the conformal etch-stop layer (24) of Thei is formed during the BACKEND PROCESS, where it is well known that the process temperature of the Backend Process is lower than 450 °C. Thus, the conformal etch-stop layer (24) of Thei cannot function to protect the STI (12) during the FRONTEND PROCESS, namely RTAs processes because the etch-stop layer was not formed on the STI (12) prior to performing the RTA processes. Applicants respectfully submit that the

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process temperature of the Frontend Process is normally over 600 °C, and because the STI (12) was directly exposed to RTAs processes (where the process temperature is about 600-750 °C) during the formation of metal salicide (22), and therefore, according to the present inventors, defects such as dislocations in the STI (12) may occur.

Applicants would like to point out that a patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified, and the question here is whether the prior art, Thei, discovered/recognized the cause of the dislocation of the STI, which the present inventors intends to solve. Furthermore, Applicants respectfully submit that in determining the relevant art of the claims in suit one looks to the nature of the problem confronting the inventor. Moreover, the question is not simply whether the prior art teaches the particular element of the invention, but whether it would suggest the desirability of that particular element for solving the problem confronting the inventor.

Because Thei substantially teaches the step of forming the conformal etch-stop layer (24) on the STI (12) after the exposure of the STI (12) to the RTA processes used for forming metal salicide (22), therefore Thei substantially fails to recognize the cause of the dislocation of the STI. In other words, HAD Thei recognized the cause of the dislocation of the STI (12) due to external stress or thermal stress, Thei would have taught forming the conformal etch-stop layer (24) on the STI (12) before performing the RTA processes to form the metal salicide (22) because RTA processes are thermal process that could cause dislocation of the STI (12). Accordingly, Applicants respectfully submit that Thei cannot possibly anticipate the proposed independent claim 12 of the

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claimed invention in this regard.

Thus, Thei substantially fails to teach or disclose a shallow trench isolation comprising at least [a liner layer, formed over the substrate covering the insulating layer so that the liner layer protects the shallow trench isolation from external stress or thermal effects] as required by the proposed independent claims 12 and 20, and therefore Thei cannot possibly anticipate Claim 12 in this regard.

Furthermore, Applicants respectfully submit that Thei cannot anticipate the newly added proposed independent Claim 27 because Thei substantially fails to teach or disclose each and every features of the claimed invention as claimed in the newly added proposed independent Claim 27. More specifically, Thei substantially fails to teach or disclose a shallow trench isolation comprising at least [a pad oxide layer directly in contact with the insulating layer and disposed between the substrate and the liner layer] as required by the amended proposed independent claims 12 and 20.

Thei substantially fails to teach or disclose any pad oxide layer that is directly in contact with the insulating layer and disposed between the substrate (10) and the liner layer (etch-stop layer 24) as required by the newly added proposed claim 27. Thus, Thei cannot possibly anticipate the newly added proposed independent Claim 27 in this regard.

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Claims 13-14 and 16-19, Claims 20-22 and 24-26, and Claims 28-31, which directly or indirectly depend from independent Claims 12, 20 and 27 respectively are also patentable over Thei at least because of their dependency from an allowable base claim.

For at least the foregoing reasons, Applicant respectfully submits that claims 12-14, 16-22, 24-26 and 27-31 patentably define over Thei. Reconsideration and withdrawal of above rejections is respectfully requested.

2. *The Office Action rejected Claims 12-26 under 35 U.S.C. 102(b) as being anticipated by Lin et al. (US-6,211,022, hereinafter Lin).*

Applicants respectfully disagree and would like to point out that the present invention as claimed in claims 12 and 20 are directed to a structure of a Shallow Trench Isolation (STI), while Lin substantially teach or disclose a conventional field oxide (FOX) 204 (obviously formed via thermal oxidation process) (please see FIG. 2, col. 2, lines 52-60), and therefore, Applicants respectfully submit that Lin cannot possibly anticipate the proposed independent claims 12 and 20.

Furthermore, Applicants respectfully submit that Thei cannot anticipate the amended proposed independent Claims 12 and 20 because Thei substantially fails to teach or disclose a shallow trench isolation comprising at least [a HDP insulating layer disposed in the trench] as required by the amended proposed independent claims 12 and 20. Because Lin substantially teach or disclose a conventional field oxide (FOX) 204, which is obviously formed via thermal oxidation process, and therefore, Lin cannot possibly teach or disclose a HDP insulating layer, disposed in the trench, as required by

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the amended proposed independent claims 12 and 20. Thus, Applicants respectfully submit that Lin cannot possibly anticipate the proposed independent claims 12 and 20 in regard as well.

Furthermore, Applicants respectfully submit that because Lin substantially fails to teach or disclose any pad oxide layer that is directly in contact with the insulating layer and disposed between the substrate and the liner layer, as required by the newly added proposed independent claim 27, and therefore Applicants respectfully submit that Lin cannot possibly anticipate the newly added proposed independent claim 27 in this regard.

Claims 13-19, claims 21-26 and claims 28-31, which directly or indirectly depend from independent claims 12, 20 and 27, are also patentable over Lin at least because of their dependency from an allowable base claim.

For at least the foregoing reasons, Applicant respectfully submits that claims 12-31 patently define over Lin. Reconsideration and withdrawal of above rejections is respectfully requested.

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CONCLUSION

For at least the foregoing reasons, it is believed that all pending claims 12-31 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel to arrange for such a conference.

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Respectfully submitted,

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